

## **REMARKS/ARGUMENTS**

### **Status of the Claims**

Claims 1-32 were pending. Claims 1, 18 and 32 have been amended, and new claim 33 has been added. No new matter is added hereby. Therefore, upon entry of this amendment, which is respectfully requested, claims 1-33 will be pending.

### **Objection to Claims**

Claims 1, 18 and 32 have been objected to for grammatical informalities. Appropriate correction has been made herein by way of amendment to claims 1, 18 and 32 as suggested by the Examiner.

### **Rejection Under 35 USC §101**

Claims 1-17 and 32 have been rejected under 35 U.S.C. 101 because they are drawn to non-statutory subject matter. Applicants have amended independent claim 1, from which claims 2-17 depend, and claim 32 to recite that the steps of receiving and automatically applying a k-nearest neighbor process are performed in a computer system. Accordingly, it is believed that this rejection has been traversed.

New claim 33 also includes similar recitation of a computer system and is therefore similarly drawn to statutory subject matter.

### **Rejections Under 35 USC §103**

Claims 1, 6, 10-18 and 22-32 have been rejected under 35 U.S.C. 103(a) as being obvious over Zimmerman et al, in view of Cabello et al., and in view of Kanai.

Claims 1-6 and 10-32 have been rejected under 35 U.S.C. 103(a) as being obvious over Zimmerman, in view of Cabello, in view of Kanai, as applied to claims 1, 6, 10-18 and 22-32, above, and further in view of Osterland,

Claims 1-32 have been rejected under 35 U.S.C. 103(a) as being obvious over Zimmerman et al. in view of Cabello, in view of Kanai, and in view of Osterland as applied to claims 1-6 and 10-32, and further in view of Kopecky.

Applicants respectfully traverse these rejections.

### **Disclosure of the Presently Claimed Invention**

The present disclosure teaches a system for identifying whether the antibody profile of a patient test sample corresponds with particular SADs from a set of SADs sought to be investigated for the patient. The training set with which a test sample is compared includes data associated with the SADs sought to be investigated for a particular patient or patients. The training set is made up of reference samples that have disease conditions that are known as well as samples that are known to be disease free ("none"). Each reference sample may therefore associated with, none, one or more of the systemic autoimmune diseases. When the test sample data set is statistically compared with the training data set using a nearest neighbor process, or algorithm, such as a k-nearest neighbor (KNN) process, or algorithm, a determination of one or more particular diseases may be achieved. Where a determination of more than one disease is made, the diseases are considered equally likely to be present in the patient test sample.

### **Main Cited References**

Zimmerman analyzes Western blots using neural network pattern recognition analysis techniques.

Cabello teaches fuzzy k-nearest neighbor classifiers for classification of sample data to one of a plurality of different disease classes. Cabello teaches selection of a single disease (see, e.g., p 89, first full paragraph: "...thus, we consider as the membership degree the largest of them.")

Kanai teaches a system that provides a medical diagnosis by discriminating attribution degrees. Kanai teaches determining the most probable disease to which a test data group is associated from multiple diseases using a ranking program, wherein the output is a ranked output of mutually exclusive diseases (see e.g., col. 5, lines 41-47; and FIG 10).

### **Arguments**

Applicants respectfully assert that the cited references, taken alone or in combination as suggested in the Office Action, fail to teach or suggest limitations of the claims. For example, the cited references fail to teach or suggest "automatically applying, in the computer system, a k-nearest neighbor process to the quantitative values of the sample data set and the reference data sets to produce a statistically derived decision indicating whether, out of a range of none, one and more than one of said systemic autoimmune diseases, the patient test sample is associated with one or more of said specific SADs, **wherein if the decision identifies more than one SAD, the patient test sample is considered equally likely to have said identified SADs**" as is recited in claim 1 (emphasis added). Similar limitations are presented in claims 18 and 32.

One outcome of a k-nearest neighbor process applied to the data as recited in the claims is that the patient test sample will be found to be clear of the systemic autoimmune diseases (SADs). Another outcome is that the patient test sample will be found to have one of the SADs. Another possible outcome is that the patient test sample will be found to have more than one of the SADs, where each of the diseases are considered as equally likely to be present in the patient test sample. This is significant because many people do, in fact, fit the definition of more than one disease or have what is called "overlap syndrome", which is a condition where there are symptoms consistent with more than one disease. The cited references, taken individually or in combination, fail to teach or suggest the capacity to provide a statistically derived decision where the outcome indicates which of one or more of the SADs the patient test sample is associated, **wherein if the decision identifies more than one SAD, the patient test sample is considered equally likely to have the identified SADs**. For example, neural network analysis as taught by Zimmerman, would at best provide a single disease as output. The techniques taught by Cabello teach outputting a single top candidate and the techniques of Kanai teaches determining to which of a plurality of mutually exclusive disease groups a patient most likely belongs. Thus, there is a difference between the claimed invention as recited in claim 1 (and 18 and 32) and a combination of the cited references in that there is a capacity to quantitatively determine and identify one or more of the SADs **wherein if the decision identifies more than one SAD, the patient test sample is considered equally likely to have the identified SADs**. The cited references lack this capacity. One technical effect of this

difference is that a much more complete diagnosis of a patient sample may be performed using the presently claimed invention. For example, a patient sample may be found to have more than one of the SADs in which case further investigations can be made looking for more than one of the SADs as the decision indicates that they are equally likely to be in the patient test sample.

Applicants also would like to point out that Kanai teaches away from finding any type of overlap condition, e.g., two equally likely diseases. This is clear from Kanai at page 79:

“However, there will be regions where the properties of the data vectors of the different classes will show considerable overlap in the measurement space. By means of the fuzzy description of the learning set, we try to get the labels of the data vectors to reflect more precisely the relation between their properties. Consequently, if the assignation of labels is adequate, the errors of the classifier will be lower.”

This of course goes hand in hand with the purpose of Kanai, which is to discriminate between arrhythmias and identify a particular arrhythmia using classifiers. By reducing errors in the classifiers, Kanai is able to remove overlap and discriminate between arrhythmias. Hence, Kanai teaches away from identifying equally likely diseases.

Accordingly, Applicants respectfully request withdrawal of the rejections to claims 1, 18 and 32 for at least the above reasoning. Further, Applicants respectfully request withdrawal of the rejections to the dependent claims, based at least on their dependency to claims 1 and 18 (no claims depend from claim 32).

As for claim 33, Applicants respectfully request allowance of this claim as the cited references fail to teach or suggest the recited limitation of “...wherein...considered equally likely to have said identified SADs” as discussed above with regard to claim 1. Further, claim 33 recites a “non-ranked statistically derived decision” which also is not taught or suggested by the cited references.

**Examiner Interview**


Applicants thank the Examiner for the interview on June 23, 2009. During the interview, the independent claims were discussed in view of Zimmerman, Cabello and Kanai. Certain potential changes to the claims were discussed. No agreement was reached, but the Examiner indicated that such changes could possibly remove the references and result in allowance, but that he would need to consider the actual changes we made in view of the cited art and possibly perform another art search. Claim amendments similar to those discussed are presented herein.

**CONCLUSION**

In view of the foregoing, Applicants believe all claims now pending in this Application are in condition for allowance and an action to that end is respectfully requested.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 925-472-5000.

Respectfully submitted,

  
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